

**C. SURFACE IMPOUNDMENT INFORMATION**

*This section addresses your in-scope surface impoundments' wastewater operations, impoundment history, liner specifications, sludge handling process, and wastewater and in-place sludge characterization data. Indicate the surface impoundment identification (name, number, or letter/number combination from Section B, Question B2) below and in the upper right hand corner of every page.*

**Please complete a separate copy of this section for each of the in-scope surface impoundments that you identified in Question B2, Column 5. We have provided one copy of this section for the number of impoundments you indicated on the screening questionnaire. If you need additional copies, please make copies now.**

**Surface Impoundment Number** \_\_\_\_\_ (please fill in number or letter/number combination from Section B, Question B2 here and on all subsequent pages in Section C for this impoundment.)

**Impoundment History and Future Plans**

*For the purpose of this questionnaire, "wastewater" means a waste liquid that contains less than 5 percent solids, by weight, and that results from manufacturing, processing, or use of a raw material, intermediate product, finished product, by-product, or waste product, or that results from cleaning or washing activities. "Sludge" means any solid, semi-solid, or liquid waste containing 5 percent solids, by weight, or greater that is generated in the course of treating or managing wastewater.*

**C1. When did this surface impoundment begin receiving wastewater and/or sludge?**



- ☐ before 1900
- ☐ 1900-1939
- ☐ 1940-1949
- ☐ 1950-1959
- ☐ 1960-1969
- ☐ 1970-1979
- ☐ 1980-1989
- ☐ 1990-present

**C2a. Has this surface impoundment permanently ceased receiving wastes since June 1, 1990?**

☐

☐ Yes — Continue to Question C2b.

☐ No — Skip to Question C3.

☐ Don't Know/Other (please explain): \_\_\_\_\_  
\_\_\_\_\_

— Skip to Question C3.

**C2b. State the month and year this impoundment permanently ceased receiving wastes:**

☐

Month: \_\_\_\_\_ Year: \_\_\_\_\_

**C2c. How do you manage the wastewater and/or sludge that you formerly managed in this impoundment?**

☐

*(Check all that apply)*

☐ Stopped producing wastewater and/or sludge that formerly went to this impoundment

☐ Built new impoundment on-site

☐ Placed in a different, already-existing impoundment on-site

☐ Built new tank on-site

☐ Placed in a different, already-existing tank on-site

☐ Sent wastewater and/or sludge off-site

☐ Discharged wastewater and/or sludge directly to surface water

☐ Other (please specify): \_\_\_\_\_

**Skip to Question C5. You must complete Question C5 and the remaining Section C questions for your closed impoundment to the best of your knowledge.**

**C3. Do you plan to stop using this surface impoundment permanently in the next:**☐

- ☐ 0-4 years?
- ☐ 5-9 years?
- ☐ 10-14 years?
- ☐ 15-19 years?
- ☐ 20-29 years?
- ☐ 30-49 years?
- ☐ more than 50 years?
- ☐ no current plans to close

**C4. After you close this impoundment, what do you plan to do with the wastewater and/or sludge that you manage in this impoundment? (Check all that apply)**☐

- ☐ Stop producing this wastewater and/or sludge
- ☐ Place in a new impoundment on-site
- ☐ Place in a different, already-existing impoundment on-site
- ☐ Place in a new tank on-site
- ☐ Place in a different, already-existing tank on-site
- ☐ Send wastewater and/or sludge off-site
- ☐ Discharge wastewater and/or sludge directly to surface water
- ☐ Other (please specify): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

For the remaining questions in section C, "reference time period" means the time period from June 1, 1990 to the present, or (if this surface impoundment has permanently ceased receiving wastes) the period from June 1, 1990 to the date the impoundment permanently ceased receiving wastes.

### **Impoundment Waste Sources and Regulatory Status**

**C5. Review your facility's operations that have contributed wastewater and/or sludge to this surface impoundment (during the reference time period), and determine the operations that have contributed the largest flows to this impoundment during that time period. For the five operations with the largest flows, describe each operation's output (e.g., intermediate product or finished product produced in that operation, or the intermediate or final service performed):**



*NOTE: If you have fewer than five separate operations that contributed wastewater and/or sludge flow to this surface impoundment, describe each operation's output and enter "NA" in the remaining blanks.*

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

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**C6. During the reference time period, has this surface impoundment received any “decharacterized” waste?** (*“Decharacterized” means that at the point where it was generated, the waste was identified as hazardous based solely on one or more of the four characteristics of hazardous waste: ignitability, corrosivity, reactivity, or toxicity, but before it was placed into this surface impoundment it ceased to exhibit any of those characteristics.*)

☐

☐ Yes

☐ No

☐ Don't Know (please explain): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**C7a. During the reference time period, has this surface impoundment received any waste that is specifically exempt or excluded from regulation under your state's implementation of the federal Resource Conservation and Recovery Act (for example, waste from the combustion of coal or fuel oil)?** *You may refer to Appendix 2, a reference table listing possible federal exemptions and exclusions, in making your determination for this impoundment. Some states do not recognize some of the exemptions and exclusions on this listing, so some of the listed exclusions or exemptions may not be available at your facility.*

☐

☐ Yes — Continue to Question C7b.

☐ No — Skip to Question C8.

☐ Don't Know (please explain): \_\_\_\_\_

\_\_\_\_\_

— Skip to Question C8.

**C7b.**

*Column 1: If you answered "Yes" to Question C7a, list below all specific exemption(s) and/or exclusion(s) that apply to this impoundment or to the wastes that have been managed in it. Please list using the specific regulatory or statutory citation listed in the left hand column of Appendix 2.*

*Column 2: For each exemption or exclusion you listed in Question C7a, and for the reference time period, please provide a rough estimate of the proportion of the influent flow that was excluded or exempt:*

Exemption or Exclusion	Portion of influent flow exempted or excluded					
	0-5%	6-25%	26-50%	51-75%	76-95%	96-100%
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**C8a. Do you have a state or local permit for any wastewater and/or sludge management, groundwater protection activities, and/or air emissions associated with this surface impoundment?**



☐ Yes — Continue to Question C8b.

☐ No — Skip to Question C9a.

☐ Don't Know (please explain): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

— Skip to Question C9a.

Facility Number: \_\_\_\_\_

C-7

Impoundment No. \_\_\_\_\_

Check the box in the right  
margin if the information is  
claimed CBI

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**C8b. If you answered “Yes” to Question C8a, provide the name of the state or local government agency that issued the permit, and the permit number (if any):**

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Agency Name: \_\_\_\_\_

Permit Number: \_\_\_\_\_

**C9a. Is this impoundment a solid waste management unit that was evaluated during a RCRA Facility Assessment (RFA), or was mentioned in an RFA report?**

☐

☐ Yes — Continue to Question C9b.

☐ No — Skip to Question C10.

☐ Don't Know — Skip to Question C10.

**C9b. If you answered “Yes” to Question C9a, in what year was the RFA performed?**

☐

\_\_\_\_\_

**C9c. If you answered “Yes” to Question C9a, was this surface impoundment a solid waste management unit that was evaluated during a RCRA Facility Investigation (RFI)?**

☐

☐ Yes — Continue to Question C9d.

☐ No — Skip to Question C10.

☐ Don't Know — Skip to Question C10.

**C9d. If you answered “Yes” to Question C9c, in what year was the RFI performed?**

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**Impoundment Design and Operation****C10. Plan and Elevation Views for this Surface Impoundment**

**In the space provided (or as an attachment), please provide plan and elevation views for this surface impoundment, to scale, and indicate the scale you used.**

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In the plan view, indicate and label:

- *an arrow for orientation to the north;*
- *the cross-section of the elevation view;*
- *all influent and effluent points for the surface impoundment, with sources and destinations of the water flow (e.g., influent from pond 1C and pond 3, effluent to Deep River);*
- *major equipment (e.g., covers, booms, pump stations, aerators);*
- *secondary containment structures (if any); and*
- *location of any monitoring wells that are within 500 feet of the impoundment's edge.*

**Plan View:**



**In the elevation view, determine an appropriate cross-sectional place (for example, through the plane of the influent and effluent points). Indicate and label:**

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- *ground level (indicate elevation above mean sea level);*
- *the shape and height of any dikes or berms;*
- *secondary containment structures (if any);*
- *equipment located within the impoundment (if any);*
- C *the average elevation of the water surface in the impoundment and a bracket to indicate the range of water surface elevations - OR - the average depth of the water surface in the impoundment relative to ground level and a bracket to indicate the range of water depths;*
- *the average depth to groundwater (from ground level);*
- *a bracket to indicate the range of depth to groundwater;*
- *monitoring well(s) within 500 feet (if any), with the screen depth(s);*
- *leak detection and monitoring devices (if any), and their type; and*
- *the liner (if any).*

For the purpose of this questionnaire, "liner" means a continuous layer of natural or man-made materials, emplaced beneath and/or on the sides of a surface impoundment, that restricts the downward and/or lateral release of waste, waste constituents, or leachate from the surface impoundment. The liner does not include naturally occurring materials (such as a naturally occurring clay layer) that, although effective in controlling the release of leachate from the surface impoundment, were not emplaced intentionally for that purpose. In this sketch, use a line to represent the liner and to indicate its position relative to the surface impoundment contents above it and the subsurface materials below it. In Question C11 we ask for a detailed sketch showing the liner's components, and in Question C12 we request information on the liner components' properties.

**Elevation view:**

Refer to the elevation sketch you drew in Question C10. If this surface impoundment has a liner, answer questions C11 through C14. If this surface impoundment has no liner, skip to Question C15.

### Liner Characteristics

#### **C11. Cross Section of Liner**



**In the space below (or as an attachment), please provide a sketch of a cross section of the liner for this surface impoundment. Please include the following on the sketch:**

- *Each material or layer that you have in place to prevent, collect, or monitor releases from your surface impoundment. Remember that you provided information on the characteristics of the subsurface beneath your impoundment in Question B9; do not include the same information here (for example, do not include a description of clay layers beneath your facility that, although effective in controlling releases from your impoundment, are naturally occurring or laterally extensive and thus have been described in Question B8).*
- *A general description of each liner material or layer (for example, compacted clay liner, high density polyethylene liner, gravel layer).*
- *A number to designate each material or layer that you sketched. Label the layer that is in contact with the wastewater and sludge/solids in the surface impoundment with the number "1". Number each layer below "1" sequentially. You will use these numbers in Question C12 to identify the physical properties of your liner materials.*

#### **Cross Section:**

**C12. The table below asks for information on the composition of each layer or material that comprises your liner. Please fill out this table, starting with the liner material or layer that you designated “1” in the previous section.**

*Column 1: Please number the layer, starting with the layer or material that you designated “1” in Question C11, i.e., the layer or material that is in contact with the wastewater and sludge/solids in the surface impoundment*

*Column 2: Provide a general description of the composition of the layer (e.g., compacted clay, geotextile membrane, gravel).*

*Column 3: What is the thickness of the layer? (specify units)*

*Column 4: What is the hydraulic conductivity of the layer (specify units)?*

*Column 5: What is the porosity (saturated water content) of the layer (volume/volume)?*

*Column 6: What is the natural moisture content of the layer (volume/volume)?*

QUESTION C12: SURFACE IMPOUNDMENT LINER DATA							
1	2	3		4		5	6
Layer Num.	General Description of Layer Material	Layer Thickness		Hydraulic Conductivity		Porosity	Moisture Content
		value	units	value	units	(vol/vol)	(vol/vol)
1							

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**C13. In what year did you install the existing liner?** \_\_\_\_\_☐**C14a. Have any liner failures occurred during the life of the existing liner?**☐

*For the purpose of this questionnaire, a liner failure means the development of one or more physical disruptions in the liner's continuity (e.g., cracks or tears), or the presence of leachate underneath the liner*

- ☐ Yes — Continue to Question C14b.
- ☐ No — Skip to Question C14d.
- ☐ Don't Know — Skip to Question C14d.

**C14b. If you answered "Yes" to Question C14a, how was the liner failure detected?**☐

*(Check all that apply)*

- ☐ leak detection system (other than groundwater monitoring)
- ☐ unusual seep
- ☐ groundwater monitoring
- ☐ other (please describe): \_\_\_\_\_
- \_\_\_\_\_

**C14c. If you answered "Yes" to Question C14a, list each liner failure event that you are aware of since the existing liner was installed. List the affected liner layer numbers from Question C11, your estimate of the month and year the liner failure event began, the month and year it was discovered, and the month and year it was resolved (i.e., the liner's physical continuity was restored). If you cannot specify calendar dates, please provide your best estimate of the year of occurrence.**

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QUESTION C14c: LINER FAILURE EVENTS			
Layer Number(s)	Date Failure Began	Date Discovered	Date Resolved

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**C14d. Do you expect the existing liner to need replacement?**☐

- ☐ Yes — Continue to Question C14e.
- ☐ No — Skip to Question C15.
- ☐ Don't Know — Skip to Question C15.

**C14e. If you answered "Yes" to Question C14d, in what year do you expect the existing liner to need replacement?**☐

\_\_\_\_\_

**C15. What are the water quality characteristics of this surface impoundment's contents?**☐

*Please complete the table on page C-15 with sampling and analysis data collected in the latest three complete calendar years this impoundment was in use. If you do not have sampling and analysis data, but can estimate values for the requested information, please provide estimates instead. For the purpose of this questionnaire, "influent" means the wastewater flow entering the surface impoundment. "Effluent" means the wastewater flow exiting the surface impoundment via an engineered structure that may be either a pipe or a channel, or the physical removal of sludge.*

You MUST complete all spaces in this table. If you did not measure a listed parameter at a particular sampling point and cannot provide an estimate, enter "UNK" in the space provided for that parameter. If you did not measure any of the listed parameters at a particular sampling point and cannot provide any estimates, enter "UNK" in the first space listed and draw a vertical line down through the remaining spaces.

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**Instructions for completing table**

*Column 1: If you measured one or more of the listed parameters in the impoundment's influent, report the measured value(s) here. Report the mean value(s) if you measured two or more samples. Specify the units of each measured value.*

*In the event this impoundment had more than one influent point, please report a weighted average value (based on flow), that reflects waste input via each influent point.*

*Column 2: If you measured one or more of the listed parameters for the liquid within this surface impoundment, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

*Column 3: If you measured one or more of the listed parameters for the sludge within this surface impoundment, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

*If there is no sludge within this impoundment, enter "NA" in the first space listed and draw a vertical line down through the remaining spaces.*

*Column 4: If you measured one or more of the listed parameters in the impoundment's effluent, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

*If there is no effluent from this impoundment, enter "NA" in the first space listed and draw a vertical line down through the remaining spaces.*

*In the event this impoundment had more than one effluent point, please report a weighted average value that reflects all effluent streams.*

C15: WATER QUALITY CHARACTERISTICS								
Parameter	1		2		3		4	
	Impoundment Influent		Liquid within Impoundment		Sludge within Impoundment		Impoundment Effluent	
	Value	Units	Value	Units	Value	Units	Value	Units
temperature								
pH								
oil and grease								
density								
viscosity								
BOD								
COD								
TOC								
TOD								
total solids								
total suspended solids								
cell yield coefficient								
biomass concentration								
MLSS								
MLVSS								

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For explanations of acronyms, definitions of technical terms, and unit dimensions associated with these parameters, see the following page.

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Definitions/unit dimensions/abbreviations:

**pH**: the negative logarithm of the hydrogen ion concentration (unitless).

**density**: the mass of wastewater and/or sludge per unit volume (units: mass/volume).

**viscosity**: the measure of the wastewater's and/or sludge's resistance to flow when acted upon by an external force (units: (force x time)/(length x length)).

**BOD (biochemical oxygen demand)**: a measure of the biodegradable organic content of the waste. Biochemical oxygen demand means the amount of oxygen used for respiration during the aerobic metabolism of an energy source by acclimated microorganisms. (units: mass/volume).

**COD (chemical oxygen demand)**: a measure of the total organic content of the waste, both degradable and refractory. Chemical oxygen demand means the amount of oxygen required for maximum oxidation of the organic matter in a sample of the waste. (units: mass/volume).

**TOC (total organic carbon)**: the amount of carbon in the organic matter in a sample (units: mass/volume).

**TOD (total oxygen demand)**: the amount of oxygen required to oxidize both the organic and inorganic matter in a sample under specific conditions (units: mass/volume).

**Total solids**: the sum of dissolved (filterable) and suspended (nonfilterable) solids (units: mass/volume).

**Total suspended solids**: the portion of a waste sample that does not pass through a glass fiber filter (units: mass/volume).

**Cell yield coefficient**: mass of cells produced per unit of substrate removed (units: mass/mass).

**Biomass concentration**: Biomass is a heterogeneous microbial population, such as an activated sludge. Biomass concentration is the dry weight of biomass per unit volume of reaction fluid (units: mass/volume).

**MLSS (mixed liquor suspended solids)**: the suspended (nonfilterable) solids concentration in the mixture of wastewater and suspended culture that is used in activated sludge processes (units: mass/volume).

**MLVSS (mixed liquor volatile suspended solids)**: the volatile suspended (nonfilterable) solids concentration in the mixture of wastewater and suspended culture that is used in activated sludge processes (units: mass/volume).



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**C16. Operating quantities**

*For the purpose of this questionnaire, “wastewater” means a waste liquid that contains less than 5 percent solids, by weight, and that results from manufacturing, processing, or use of a raw material, intermediate product, finished product, by-product, or waste product, or that results from cleaning or washing activities. “Sludge” means any solid, semi-solid, or liquid waste containing 5 percent solids, by weight, or greater that is generated in the course of treating or managing wastewater.*

**Instructions for completing table**

***The term “quantity” refers to the units of volume (e.g., gallons), mass (e.g., metric tons), or flow rate (e.g., gallons per minute) that you use to measure the amount of wastewater and sludge within your impoundment, entering your impoundment, and exiting your impoundment.***

*Column 1: Use this column to enter quantities and units for wastewater.*

*Column 2: Use this column to enter quantities and units for sludges.*

*Row 1: Typical operating quantity. Enter the quantity of wastewater (column 1) and sludge (column 2) managed in this surface impoundment when you operate(d) it under typical conditions. You may specify a range of quantities that reflect “typical” conditions.*

*Row 2: Maximum operating quantity. Enter the quantity of wastewater (column 1) and sludge (column 2) that you could manage in this surface impoundment under the conditions that no overflow and no overtopping occur, although effluent may be discharged through the engineered effluent structure.*

*Row 3: Average influent quantity. Enter the mean daily quantity of wastewater (column 1) and sludge (column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

*Row 4: Maximum influent quantity. Enter the maximum daily quantity of wastewater (column 1) and sludge (column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

*Row 5: Minimum influent quantity. Enter the minimum daily quantity of wastewater (column 1) and sludge (column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

*Row 6: Average effluent quantity. Enter the mean daily quantity of wastewater (column 1) and sludge (column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

*Row 7: Maximum effluent quantity. Enter the maximum daily quantity of wastewater (column 1) and sludge (column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

*Row 8: Minimum effluent quantity. Enter the minimum daily quantity of wastewater (column 1) and sludge (column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Table C16: OPERATING VOLUMES				
	1 Wastewater (with <5% <sub>wt</sub> solids)		2 Sludge (with 5% <sub>wt</sub> solids)	
	Value	Units	Value	Units
typical operating quantity				
maximum operating quantity				
average influent quantity				
maximum influent quantity				
minimum influent quantity				
average effluent quantity				
maximum effluent quantity				
minimum effluent quantity				

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**C17. What is the surface area of this impoundment?**☐

\_\_\_\_\_(units: \_\_\_\_\_)

**C18. What is the mean hydraulic residence time in the impoundment?**☐

\_\_\_\_\_(units: \_\_\_\_\_)

**C19. What function(s) does this surface impoundment perform?**☐*Please note the following definitions:*

Disposal means discharge, deposit, injection, or placing of a waste into or on any land or water so that the waste or its constituents may enter the environment, be emitted into the air or discharged into any waters, including groundwaters.

Storage means the containment of waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal.

Treatment means any method, technique, or process (including neutralization), designed to change the physical, chemical, or biological character or composition of the waste.

**(Check all that apply)**

- ☐ Storage prior to treatment
- ☐ Storage after treatment
- ☐ Storage (no treatment occurs in the wastewater's and/or sludge's management system)
- ☐ Treatment
- ☐ Disposal through seepage or infiltration (into the ground)
- ☐ Disposal through evaporation
- ☐ Other (please explain): \_\_\_\_\_

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**C20. If you answered “Treatment” as one of the functions in Question C19, which of the following treatment processes/unit operations occur in this impoundment?**

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*(Check all that apply)*

- ☐ Aeration (wastewater is exposed to air or air is introduced)  
— Answer Question C22
- ☐ Mixing (mechanical mixing of wastewater, e.g., with paddles)  
— Answer Question C21
- ☐ Flocculation (rapid mixing of coagulant chemicals followed by gentle agitation)
- ☐ Sedimentation (particle settling)
- ☐ Filtration (e.g., filter bed of granular media)
- ☐ Coagulation (using chemicals to remove suspended matter)
- ☐ Disinfection (using chemicals to destroy pathogens)
- ☐ Precipitation (using chemicals to form insoluble precipitates)
- ☐ Ion exchange (ion exchange bed or column)
- ☐ Adsorption (bed or column of adsorbent material)
- ☐ Chemical oxidation (chemical reaction to increase oxidation state of contaminants)
- ☐ Nitrification (ammonia nitrogen converted to nitrite and nitrate)
- ☐ Denitrification (nitrite and nitrate converted to gaseous nitrogen)
- ☐ Carbonaceous biochemical oxygen demand (CBOD) removal
- ☐ Anaerobic biological treatment process
- ☐ Aerobic biological treatment process
- ☐ Facultative treatment process
- ☐ pH adjustment
- ☐ Temperature adjustment
- ☐ Other (please explain): \_\_\_\_\_

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**C21a. If you answered “mixing” in Question C20, which of the following model types best represents this impoundment’s operation:**

- ☐ A plug flow reactor (a reactor in which the contents experience little or no mixing as they flow from influent to effluent)
- ☐ A continuous-flow stirred-tank reactor or complete-mix reactor (instantaneous dispersion throughout reactor volume)
- ☐ Other (please describe: \_\_\_\_\_)
- ☐ Don’t Know

**C21b. If you answered “mixing” in Question C20, provide the number of mixers, delivered power, impeller diameter, and impeller speed:**

*For any values that you do not have available, enter “UNK”*

Number of mixers: \_\_\_\_\_

Average delivered power per mixer: \_\_\_\_\_ (units: \_\_\_\_\_)

Average mixer impeller diameter: \_\_\_\_\_ (units: \_\_\_\_\_)

Average mixer impeller speed: \_\_\_\_\_ (units: \_\_\_\_\_)

**C22a. If you answered “aeration” in Question C20, indicate the type of aeration that occurs in this surface impoundment:**☐*(Check all that apply)***Mechanical:**

- ☐ Low-speed surface — Answer Question C22b
- ☐ Low-speed with draft tube — Answer Question C22b
- ☐ High-speed floating — Answer Question C22b
- ☐ Rotor brush — Answer Question C22b

**Diffused-air:**

- ☐ Fine bubble porous diffuser — Answer Question C22c and C22d
- ☐ Medium bubble porous diffuser — Answer Question C22c and C22d
- ☐ Coarse bubble porous diffuser — Answer Question C22c and C22d
- ☐ Static tube — Answer Question C22c and C22d
- ☐ Jet — Answer Question C22c and C22d

**Waterfall:**

- ☐ spray
- ☐ cascade
- ☐ tray

**Other:**

- ☐ Turbine-sparger — Answer Question C22b
- ☐ (please specify:\_\_\_\_\_)

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**C22b. If your answer to Question C22a included any aerator types in the “Mechanical” category, or “Turbine-sparger,” provide the following information:**

☐

*For any values that you do not have available, enter “UNK”.*

Number of aerators \_\_\_\_\_

Average delivered power per aerator \_\_\_\_\_ (units: \_\_\_\_\_)

Average impeller diameter: \_\_\_\_\_ (units: \_\_\_\_\_)

Average impeller rotational speed: \_\_\_\_\_ (units: \_\_\_\_\_)

Oxygen saturation coefficient ( $\beta$ , or ratio of saturation concentration in waste to saturation concentration in water): \_\_\_\_\_

Oxygen transfer correction factor ( $\alpha$ , or ratio of mass transfer coefficient of wastewater to mass transfer coefficient of tap water): \_\_\_\_\_

**C22c. If your answer to Question C22a included any aerator types in the “Diffused-air” category, is the liquid surface quiescent or turbulent?**

☐

- ☐ Quiescent  
☐ Turbulent  
☐ Don't Know

**C22d. If your answer to Question C22a included any aerator types in the “Diffused-air” category, what is the diffused air rate, expressed as air (or oxygen) volume per unit time per volume of wastewater?**

☐

\_\_\_\_\_ air (units: \_\_\_\_\_ / \_\_\_\_\_) / \_\_\_\_\_ wastewater (units: \_\_\_\_\_)  
)

\_\_\_\_\_ oxygen (units: \_\_\_\_\_ / \_\_\_\_\_) / \_\_\_\_\_ wastewater (units: \_\_\_\_\_)  
)

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**Chemical Constituent Concentrations and Mass Quantities**

*The purpose of this section is to collect information on:*

- *Question C23: the type of sampling performed at this surface impoundment*
- *Question C24: the quantities of chemical constituents present in this surface impoundment*
- *Question C25: the quantities of chemical constituents present in this surface impoundment's influent and effluent, and constituents lost from this surface impoundment through leaching, volatilization, and treatment.*

EPA requests information only for the chemical constituents in Appendix 3 - "List of Chemical Constituents of Interest."
--

*We realize that you may have information on constituent concentrations or mass only at certain points in your wastewater treatment system (and not other points). Questions C24 and C25 are formatted so that you can provide the information that you already have available, for those points in your wastewater treatment system that you have already sampled or for which you have estimated constituent concentrations or mass. You are **NOT** required to perform additional sampling or estimations, although EPA encourages you to perform sampling or estimations if the requested data are not available.*

*If you have more than one sampling and analytical data point for a chemical constituent, please report one data point per row.*

*If it is easier to provide copies of existing sampling and analysis reports or summaries than to supply the information in the format we have requested here, then you may supply a copy of those reports or summaries instead.*

*Finally, you may know of reasons for variability in the data you report for your surface impoundment (for example, relating to production cycles, seasonal or climatic influences, or equipment cleaning). Please explain the reasons for variability along with your hard copy responses, or in a text format with your electronic responses.*



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**C23. Surface Impoundment Sampling and Analysis**

*The tables on the following pages request information on the surface impoundment sampling and analysis performed at your facility. Please use these tables to describe the sampling and analysis conducted at this surface impoundment in the latest three complete calendar years it was in use. You are not required to conduct new sampling and analysis to answer this question.*

*Please complete a separate table for each of the following points at which you have performed sampling or estimations:*

- *impoundment influent (Table C23a)*
- *wastewater within the impoundment (Table C23b)*
- *sludge within the impoundment (Table C23c)*
- *impoundment effluent (Table C23d)*
- *air above impoundment (Table C23e), and*
- *leachate collected from the impoundment (Table C23f).*

*If you have not performed any sampling or estimations at a particular point, enter “UNK” in the space provided at the top of that table.*

**Instructions for completing table**

- Column 1: List the Appendix 3 chemical constituents analyzed. Complete columns 2 and 3 of the table for each constituent analyzed. However, if you analyzed for a group of constituents using a single analytical method (e.g., volatile organics by Method 8240), you do not need to list each specific constituent in Column 1; instead, enter the appropriate group name, such as “volatile organics”.*
- Column 2: Indicate the number of times per year you collected and analyzed samples for the constituent or group of constituents in column 1. You can average the number of samples across the number of calendar years for which you are reporting results.*
- Column 3: Identify the analytical method (e.g., EPA method number) that was used to analyze the samples.*

**Table C23a: Impoundment Influent**

[illegible][illegible]

Check the box in the right margin if the information is claimed CBI

*If you have questions, call the RCRA, Superfund & EPCRA Hotline at 1-800-424-9346.*

**Table C23c: Sludge within impoundment**

[illegible]

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

Check the box in the right margin if the information is claimed CBI

[illegible]

Check the box in the right margin if the information is claimed CBI

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

Check the box in the right margin if the information is claimed CBI

[illegible]

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**C24. Chemical Constituent Concentration or Mass Data - Impoundment Contents**

*This question requests information on the Appendix 3 chemical constituents' concentrations or mass while they are within this surface impoundment.*

*This question is set up as two tables: table C24a for "wastewater within impoundment," and table C24b for "sludge within impoundment." Note the definitions of wastewater and sludge in the Appendix 4 glossary.*

*You are not required to perform any new sampling/analysis, or any new estimates of mass loadings to answer this question. However, EPA requests that you estimate concentrations or mass loadings based on your knowledge of facility processes. Complete the tables with information you have available from the latest three complete calendar years this surface impoundment was in use. If you require additional space, photocopy the page(s) you need before making entries.*

*To save you time and effort in preparing your response, EPA has pre-loaded the tables below with chemical constituents that may be present in this surface impoundment. For pre-loaded constituent(s) that are not present in this surface impoundment, strike through the pre-loaded constituent name(s). If there are constituents present in this surface impoundment that are not pre-loaded onto the tables, add the names of those constituents to the tables and provide your available data for those constituents.*



---

**Instructions for completing table**

- Column 1: Enter the name of each Appendix 3 chemical constituent you believe was present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use.*
- Column 2: Place an "X" in this column if you know that this chemical was present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use, but you do not know the chemical constituent's quantity.*
- Column 3: Enter the date that the constituent was sampled, or the averaging period that an estimate represents.*
- Column 4: Enter the concentration of the chemical constituent, if your information is expressed as concentration, or enter the mass of the chemical constituent, if your information is expressed as mass. Indicate the units in the subcolumn headed "units." If the entry is an estimate rather than analytical laboratory results, annotate the entry with an "E." For metals, indicate if the results represent total metals concentrations or mass (unfiltered samples) by annotating the entry with a "T"; indicate if the results represent dissolved metals concentrations or mass (filtered samples) by annotating the entry with a "D". If the entry is based on analytical laboratory results and measured flow data, rather than an estimate, annotate the entry with an "M".*
- Column 5: (Table C24a only) If you have a value for the biological degradation rate (BDR) of the constituent listed in column 1, please state it here along with its units. The biological degradation rate should not include degradation due to non-biological processes such as hydrolysis or photolysis.*

Table C24a: Wastewater within impoundment

If you have more than 12 entries, stop now to copy the necessary number of pages.

TABLE C24a: WASTEWATER WITHIN IMPOUNDMENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration OR Mass per Unit Time		Biological Degradation Rate	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Table C24b: Sludge within impoundment

If there is no sludge within this impoundment, continue to Question C25.

If you have more than 12 entries, stop now to copy the necessary number of pages.

TABLE C24b: SLUDGE WITHIN IMPOUNDMENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration		Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

**C25. Chemical Constituent Concentration or Mass per Unit Time Data**

*The tables on the following pages request the concentrations or mass per unit time of the chemical constituents listed in Appendix 3, at the following points:*

- *wastewater influent (Table C25a)*
- *sludge placed into this impoundment (Table C25b)*
- *wastewater effluent (Table C25c)*
- *sludge effluent (Table C25d)*
- *air above the impoundment (Table C25e), and*
- *leachate from the impoundment (Table C25f).*

*To save you time and effort in preparing your response, EPA has pre-loaded the tables below with chemical constituents that may be present in the surface impoundment wastewater influent, surface impoundment wastewater effluent, impoundment sludge, air above the impoundment, or leachate from the impoundment.*

- C If we pre-loaded the names of constituent(s) that are not present at one or more of the points listed above, strike through the pre-loaded constituent name(s).*
- C If there are constituents present at one or more of the points listed above that are not pre-loaded onto the tables, add the names of those constituents to the tables and provide your available data for those constituents.*

You are not required to perform any new sampling/analysis, or any new estimates of mass loadings to answer this question. However, EPA requests that you estimate concentrations or mass loadings based on your knowledge of facility processes. Complete the tables with information you have available from the past three complete calendar years. If you require additional space, photocopy the page(s) you need before making entries.

---

**Instructions for completing table**

- Column 1: Enter the name of the chemical constituent from Appendix 3 that you believe was present in this impoundment's influent wastewater, sludge placed in this impoundment, this impoundment's effluent (either wastewater or sludge), air emissions, or leachate, during the latest three complete calendar years this surface impoundment was in use.*
- Column 2: Place an "X" in this column if you know this chemical constituent is (or has been) present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use, but you do not know its quantity. If you place an "X" in this column, you do not need to complete columns 3 through 6.*
- Column 3: Enter the date that the constituent was sampled, or the averaging period that an estimate represents.*
- Column 4: Enter the concentration of the chemical constituent, if your information is expressed as concentration. Indicate the units in the subcolumn headed "units." If the entry is an estimate, rather than analytical laboratory results, annotate the entry with an "E." For metals, indicate if the results represent total metals concentrations (unfiltered samples) by annotating the entry with a "T"; indicate if the results represent dissolved metals concentrations (filtered samples) by annotating the entry with a "D".*
- Column 5: Enter the mass per unit time of the chemical constituent, if your information is expressed as mass flux. Indicate the units in the subcolumn headed "units." If the entry is based on analytical laboratory results and measured flow data, rather than an estimate, annotate the entry with an "M." For metals mass results that are based on sampling, indicate if the results represent total metals (unfiltered samples) by annotating the entry with a "T"; indicate if the results represent dissolved metals (filtered samples) by annotating the entry with a "D."*

Facility Number: \_\_\_\_\_

Impoundment No. \_\_\_\_\_

Check the box in the right margin if the information is claimed CBI

Table C25a: Wastewater influent

If this impoundment has more than one influent point, please photocopy this table and complete it for each influent point. State the average flow rate (with units) at this influent point here:\_\_\_\_\_ (units:\_\_\_\_\_)

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25a: WASTEWATER INFLUENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration		Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Facility Number: \_\_\_\_\_

Impoundment No. \_\_\_\_\_

Check the box in the right margin if the information is claimed CBI

Table C25b: Sludge placed into this impoundment

If you do not place sludge into this impoundment, write “N/A” here \_\_\_\_\_, and continue to table C25c.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25b: SLUDGE PLACED INTO THIS IMPOUNDMENT						
1  Constituent Name	2  Present, but Quantity Unknown?	3  Sampling Date or Averaging Period	4  Chemical Concentration		5  Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Table C25c: Wastewater effluent

If you do not have any wastewater effluent from this impoundment write “NA” here \_\_\_\_\_, and continue to table C25d.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25c: WASTEWATER EFFLUENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration		Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐



Facility Number: \_\_\_\_\_

Impoundment No. \_\_\_\_\_

Check the box in the right margin if the information is claimed CBI

Table C25d: Sludge effluent

If you do not remove sludge from this impoundment, write “N/A here \_\_\_\_\_ and continue to table C25e.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25d: SLUDGE EFFLUENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration		Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Table C25e: Air above this impoundment

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25e: AIR ABOVE THIS IMPOUNDMENT						
1	2	3	4		5	
Constituent Name	Present, but Quantity Unknown?	Sampling Date or Averaging Period	Chemical Concentration		Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Facility Number: \_\_\_\_\_

Impoundment No. \_\_\_\_\_

Check the box in the right margin if the information is claimed CBI

Table C25f: Leachate from this impoundment

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C25f: LEACHATE FROM THIS IMPOUNDMENT						
1  Constituent Name	2  Present, but Quantity Unknown?	3  Sampling Date or Averaging Period	4  Chemical Concentration		5  Mass per Unit Time	
			Value	Units	Value	Units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

**C26. Please list the overtopping events (level of wastewater in this impoundment rises above the lowest point on the dike) and dike or berm failures that have occurred since the impoundment was put into service, the date(s) each event occurred, the cause(s) (if known), and your best estimate of the amount of waste released.**

QUESTION C26: OVERTOPPING EVENTS				
Event Type (overtopping/ dike/berm failure)	Date(s)	Cause(s)	Amount of Waste Released	
			value	units

- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

**C27a. Review your Question C10 plan and elevation views of this surface impoundment. If you indicated any monitoring wells on the views, are those wells capable of detecting a release of an Appendix 3 chemical constituent from this surface impoundment in excess of background levels?**

☐

- ☐ Yes — Continue to Question C27b.
- ☐ No — Skip to Question C28.
- ☐ Don't Know — Skip to Question C28.

**C27b. If you answered "Yes" to Question C27a, have you detected a release of an Appendix 3 chemical constituent from this surface impoundment, in excess of background levels?**

☐

- ☐ Yes — Continue to Question C27c.
- ☐ No — Skip to Question C28.
- ☐ Don't Know — Skip to Question C28.

Facility Number: \_\_\_\_\_

C-45

Impoundment No. \_\_\_\_\_

Check the box in the right  
margin if the information is  
claimed CBI

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**C27c. If you answered “Yes” to Question C27b, did the magnitude of the release:**

*(Check all that apply)*

☐

- ☐ prompt a notification to your state environmental agency?
- ☐ prompt assessment monitoring to determine the nature and extent of contamination?
- ☐ prompt another action that is required under state law?

If you answered “Yes” to Question C2a, go to Question C28a. If you answered “No” or “Don’t Know” to Question C2a, you have completed Section C for this surface impoundment. Please complete an additional copy of Section C for any other in-scope impoundments at this facility.

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**Closure Information and Description of the Impoundment Cap**

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*If you have questions, call the RCRA, Superfund & EPCRA Hotline at 1-800-424-9346.*

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**C28a. Please describe the closure practices for this surface impoundment, using the table below:****Instructions for completing table***Column 1: Indicate if this action took place.**Columns 2 and 3: If you checked Column 1, indicate the month and year the action took place.**Column 4: Indicate if this action did not take place.**Column 5: Indicate if you don't know if the action took place.**Row 1: After this impoundment permanently ceased receiving waste, was it drained of liquids?**Row 2: After this impoundment permanently ceased receiving waste, were sludges removed?**Row 3: After this impoundment permanently ceased receiving waste, was any fill material placed in it?**Row 4: After this impoundment permanently ceased receiving waste, was any cover material placed on it?*

<b>TABLE C28a: CLOSURE PRACTICES</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	<b>Yes</b>	<b>Month</b>	<b>Year</b>	<b>No</b>	<b>Don't Know</b>
1. Liquid drained?					
2. Sludges removed?					
3. Fill material placed?					
4. Cover placed?					

☐  
☐  
☐  
☐

- If you answered “No” or “Don’t Know” to both question 3 and question 4 in Table C28a, **you have completed Section C for this impoundment.** If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments.
- If you answered “Yes” to question 3 in Table C28a, please answer Question C28b.
- If you answered “Yes” to question 4 in Table C28a, please answer Questions C28b through C28f. (Note: You already may have responded to Question C28b if you answered “Yes” to question 3 in Table C28a).

**C28b. Provide a schematic diagram of your closed surface impoundment, showing:**



- a rough indication of the scale of the diagram
- the thickness of the cover (if any)
- the thickness of fill material (if any)
- the depth from the top of the impoundment (including the cover) to the natural subsurface materials (soil or geologic materials) at the bottom of the impoundment

**Schematic diagram:**

Facility Number: \_\_\_\_\_

C-48

Impoundment No. \_\_\_\_\_

Check the box in the right  
margin if the information is  
claimed CBI

If you answered "No" to question 4 in Table C28a, **you have completed Section C for this impoundment.** If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments.



**C28c.** If you answered “Yes” to row 4 of Table C28a, please complete the following table for each distinct layer in the cover of your impoundment. If you do not know the requested information, enter “UNK”

- Column 1: Please number the layer, starting with the topmost layer.
- Column 2: Please provide a brief description of the layer (e.g., asphalt, sand, silt, clay, sandy-silt, etc.)
- Column 3: What is the depth of the cover layer? (please specify units)
- Column 4: What is the hydraulic conductivity of the cover layer? (specify units)
- Column 5: What is the porosity (saturated water content) of the cover layer (vol/vol)?
- Column 6: What is the natural moisture content of the cover layer (vol/vol)?
- Column 7: What is the bulk density of the cover layer? (specify units)
- Column 8: What is the percent organic carbon of the cover layer? (%)

QUESTION C28c: COVER LAYER CHARACTERIZATION										
1	2	3		4		5	6	7		8
Cover Layer	Brief Description	Thickness		Hydraulic conductivity		Porosity (vol/vol)	Moisture Content (vol/vol)	Bulk Density		Percent Organic Carbon %
		Value	Units	Value	Unit			Value	Units	

☐

☐

☐

☐

☐

☐

☐

☐

---

**C28d. What is the average surface slope of the cover?** \_\_\_\_\_% (If you do not have an estimate of the average surface slope of the cover, provide the value for the following:

$$\frac{[(\text{the maximum elevation of the cover}) - (\text{the minimum elevation at the edge of the cover})] \times 100}{\text{the horizontal distance between the maximum elevation and the minimum elevation}}$$

Please be sure that you perform this calculation using the same units of distance [e.g., all values are in feet].)

**C28e. What percentage of the cover's surface area is vegetated?**

☐

(Check one)

- ☐ 0 - 5 %
- ☐ 6 - 25 %
- ☐ 26 - 50%
- ☐ 51 - 75%
- ☐ 76 - 95%
- ☐ 96 - 100%

**C28f. If more than 5% of the cover's surface area is vegetated, describe the vegetation that is present:**

☐

(Check all that apply)

- ☐ grass
- ☐ low shrubs
- ☐ trees
- ☐ other (please describe: \_\_\_\_\_)

)

**END OF SECTION C (for this impoundment)**

If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments. If you have completed Section C for all of your in-scope surface impoundments, you have finished with this questionnaire. Thank you very much for your time, effort, and assistance.